

Enhancing Application of Artificial Intelligence in Assessments in Higher Education

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Abstract—This study is an effort to understand the applications of AI in academics in general and in assessments specifically. The result of the study stands relevant for identifying the gaps in requirement and application which can be used for enhancing the usage of AI in assessments in higher education institutions.

Index Terms— higher education, assessments, teaching learning, analytics, administrative activities and artificial intelligence.

I. INTRODUCTION

Education has been witnessing digital transformation since the advent of computers, but the applications have expanded multi-fold since then. Artificial Intelligence (AI) has taken a forefront in all fields including education [1]. The major areas identified by earlier research include education quality, student services and student learning. Education has been witnessing digital transformation since the advent of computers, but the applications have expanded multi-fold since then. The stakeholders of the education fraternity, inclusive of students, faculty members, administrators are making considerable efforts towards developing and implementing AI for the transformation of education [2]. The processes which have seen the maximum attention on education include adaptive learning systems, automated assessment systems and information processing for effective decision-making [3]. Teachers in higher education with long experience are apprehensive about adopting AI in their core processes. There are not plentiful studies in this area of research.

II. LITERATURE REVIEW

As per the report of India AI, 2023, 44% of teachers are intrigued by the applications of AI in teaching learning process and assessments. Development of automated grading system is one of the most important applications of artificial intelligence in higher education grading system. These kinds of systems use different AI based algorithm, natural language processing to get the response of the students on examination. AI applications in higher education institutions are gradually increasing across the globe. This strategy is made possible by AI technologies, which allow for real-time modifications to the curriculum, intelligent tutoring, and the use of predictive analytics to identify and resolve learning difficulties [4].

As AI technologies advance, its incorporation into teaching methods holds potential for individualized instruction as well as a wider revolution in teaching approaches and results. AI based grading systems can grade open end responses and essays-based questions. If we do these things with traditional system, it requires substantial human effort. Reinforcing learning in real time is also possible through these AI- driven system, as they provide the accurate feedback in no time [5].

Personalized learning is a crucial strategy in contemporary education, emphasizing the need for customized teaching methods to increase student achievement and engagement [6]. AI can also help with the development of personalized learning. In this type of learning, AI -Driven tests will serve as a tool to direct students' learning as well as a gauge of their knowledge. This approach will definitely lead to a kind of holistic evaluation by considering a broader spectrum of skills and competencies beyond just academic knowledge. And this is the thing which New Education Policy is focusing on. Non-cognitive and soft skills like communication, creativity, critical thinking and are very much required in higher education [7]. Assessment of these non – cognitive skills is easy through the AI assessment methods.

III. RATIONALE OF THE STUDY

Higher education attracts students from varied backgrounds and diverse learning styles. AI offers a unique advantage of facilitating the modulation of the study content to suit the learning capabilities and styles of the incumbents. Adaptive learning, teacher assessment, application of virtual reality in virtual classrooms, smart campus and smart tutoring are some important applications of AI in education [8]. The study is conducted amongst higher education students of professional courses in India. 43.3 million Students are enrolled in higher education in India in 2024, out of which 12 percent are in post graduate courses (Ministry of Education, Government of India). This huge population is exposed to AI on a regular basis, and it makes it imperative to understand the perceptions and willingness of the stakeholders of this section especially when there are very few studies of this type available for this section and this region.

III. METHODOLOGY

A. The Study

This research work is conducted in two phases:

Phase 1: To identify the areas of application of AI in higher education

Phase 2: To identify the factors influencing use of AI in Assessments in higher education. Assessments were the most important factor identified in phase I of the study.

B. Sample

The sample was collected from faculty members involved in teaching post graduate professional courses. Professional courses offered at post graduate level, as against mass bachelor courses, are career building courses and have a long-term impact on student's professional life. Academicians tend to invest crucial efforts in such courses as compared to the mass bachelor courses. All the faculty members at the time of data collection were employed in full time teaching jobs across the Indian sub-continent. The sample was collected using snowball sampling which started from a database of academicians involved in post graduate professional courses developed through the connects of the authors. Further references were requested from the respondents. The eligibility of the respondent to participate in the survey was based on his/her active teaching in the post graduate professional courses.

C. The Construct

The construct to identify the areas of application of AI in higher education institutions for the study were developed by the authors since no specific standardized scale was available for use. This construct included statements covering the entire gamut of academic activities that faculty members of higher education institutions are involved in, e.g. creation and distribution of study material, development and/or usage of teaching aids, student involvement and engagement analysis, development and analysis of assessment, study segmentation for allied areas like mentoring, career guidance, etc.

Based on the results of the Phase I, a set of statements was developed to understand the factors influencing AI in assessments in higher education. Some items from the scale on The General Attitudes towards Artificial Intelligence Scale [9] were modified to suit the study. All statements used in the scales were measured on a five point agree-disagree scale where 5 stands for strongly agree and 1 stands for strongly disagree. The statements marked with asterisk were reverse coded.

V. RESULTS AND DISCUSSION

Phase I results: First, the tools used for the study were evaluated for face and content validity. For understanding the principal factors of the scale on applications of AI in higher education, Exploratory Factor Analysis was conducted for the sample (n) of 689. The confirmatory test of the confirmatory tests KMO was found to be 0.64 and Bartell's test of sphericity was also calculated and found to be significant at 0.05 level, which both met the requisite standards.

Four factors were extracted out of 38 statements, using principal component factor analysis using varimax rotation. The factors explained 79.9% of the variance with each factor having eigen value greater than one. Further reliability of the scale and subscales was checked using Cronbach's alpha coefficient. Results are given in Table 1. All the 38 variables (statements) had factor loadings greater than 0.5 and none of the variables cross loaded. Among the four factors, assessment was found to be the most important factor (refer Table 3)

Phase II Results: The scale developed for assessing the factors affecting use of AI in assessments in higher education indicated existence of three factors which explained 77.8% of variance (refer Table 3). The preliminary test of KMO was tested as 0.72 and Barlett's test of sphericity was also calculated and found to be significant at 0.05 levels. Further reliability of the scale and subscales tested using Cronbach's alphas is significant as given in Table 1.

VI. CONCLUSION

The areas which were prominently demarked by the study in terms of application of AI in higher education institutions included assessments, teaching learning, analytics and administrative activities, in order of their importance. AI needs to be perceived as a facilitator and not a replacement of the intellectual acumen that faculty members have. Though the applications of AI in education are multifaceted, out of which the respondents find assessments or evaluation process to be the most significant of all suggests that AI can be used for questions for assessments [10].

Answer books, assessments, and other assessment types can undergo automated evaluation [11]. Using AI for assessments not only reduces workload but also increases accuracy of assessment [12]. AI is able to generate assessments which can be customized as per the learner progression. Image recognition can be used to standardize performance evaluation while being time saving.

Most teachers find evaluation to be a mundane task and get very exhausted in the process even they realize that this is an essential part of the teaching process. In higher education this is imperative and crucial since the learners are more concerned and involved in the process essentially because of the feedback involved for betterment.

Their scores also operate during filtering criteria for placements. Individualized feedback of large classes is time consuming and sometimes loose priority in the busy schedule of higher education teachers. Summarizing the aspects treated as most significant in promoting usage of AI, the study concludes that by increasing the trust on AI applications should be enhanced, indicating need for well-defined security policies. Providing technical support to enhance expertise will also be required and last but not the least increasing the ease of use amongst teachers will surely increase the usage. The implications of the study stand valid for the various AI platforms who require to promote their usage. The study also spells the scope of future research in this area. The present study is preliminary in nature and can proliferate advanced studies in each minor aspect of the use of AI while also exploring the novel uses of AI in higher education.

TABLE I. SHOWING RESULTS OF RELIABILITY TEST FOR PHASE I AND II

Showing Results of Reliability test for Phase I and II			
Scale	Sub Scale	Cronbach's Alpha	Phase II: Sample Size (N)
Phase I: Application of AI in Higher Education		0.72	689
	Assessments	0.76	546
	Course Delivery	0.69	79.24%
	Analytics	0.71	278
	Administrative Activity	0.7	268
Phase II: Attitude towards AI based assessment tools in Higher Education		0.74	196
	Trust in AI	0.71	162
	Technology Applications	0.69	188
	Ease of Use	0.78	143

TABLE II. RESULTS OF FACTOR ANALYSIS OF PHASE I

Results of Factor Analysis of Phase I			
	<i>Factor</i>	<i>Variables</i>	<i>Factor Loading</i>
1	Assessments	Automated grading	0.856
		Customized creation of assessments	0.802
		Quizzes that can be customized	0.796
		Individual feedback on learners/ assessments	0.745
		Assessments based on learner progress	0.755
		Automated scheduling of assessments	0.699
		Preparation of assessments	0.675
		Secure assessment system	0.644
		Study content as per grading of students	0.624
		Plagiarism check of student submission	0.61
		Track progress of students to group students on basis of learning progress	0.607
		Peer assessment tools	0.599
		Assessment wise detailed feedback	0.578
2	Teaching Learning	Class content preparation and updating	0.834
		Student centric learning	0.829
		Customized Reading material as per learner readiness	0.813
		Dynamic content for class delivery	0.795
		Interactive case situations/ simulation exercises/problem solving	0.782
		Content for especially abled students	0.685
		Content availability as per learner's readiness	0.64
		Consistent learner engagement	0.613
		Collaborative learning activities	0.588
3	Analytics	Data on student engagement	0.799
		Details on student progress	0.764
		Curriculum completion data	0.723
		Progressive Analysis of learners	0.689
		Predictive analytics for potential learning failures	0.675
		Learning metrics as per content provided	0.662
		Activity wise in-depth analysis	0.593
		Cumulative course assessments	0.559
4	Administrative Activities	Monitoring of student results	0.784
		Regular Report Generation	0.745
		Automated Class Communication	0.739
		Course curriculum mapping/ CO-PO mapping	0.702
		Curriculum Development	0.694
		Activity Calendar	0.659
		Automated report card generation	0.623
		Handling student services	0.574
Eigen Value and Variance explained			
Factor	Eigen Value	Variance Explained (%)	Total Variance Explained (%)
1	4.36	33.9	33.9
2	3.1	22.8	55.7
3	2.23	16.5	72.2
4	1.56	7.7	79.9

TABLE III. RESULTS OF FACTOR ANALYSIS OF PHASE II

Results of Factor Analysis of Phase II			
	<i>Factor</i>	<i>Variables</i>	<i>Factor Loading</i>
1	Trust in AI	I have no surety on results given by AI (*)	0.895
		AI assessments are unbiased.	0.873
		I am required to recheck the results given by AI (*)	0.851
		I feel that AI has no emotional touch and doesn't acknowledge student uniqueness (*)	0.813
		AI gives too much information to students (*)	0.794

		Students trust AI based results and don't question them	0.787
		I trust my evaluation more than AI (*)	0.759
		AI reduces the student teacher relationship. (*)	0.73
		The accuracy of AI assessments designed as per learner progress is unmatched.	0.701
		Leaners can get a very detailed analysis of assessments	0.693
		Artificial Intelligence can have positive impacts on people's wellbeing.	0.651
		Artificial Intelligence is exciting.	0.601
		An artificially intelligent agent would be better than an employee in many routine assessment jobs at an educational institute	0.589
2		There are many beneficial applications of Artificial Intelligence for assessments.	0.559
	Technical Expertise	Working with AI is easier than working with humans	0.859
		I can learn the application of AI easily	0.829
		I find AI complex and difficult to use (*)	0.816
		Students understand AI results effectively	0.788
		Students are very AI savvy	0.665
		AI creates secure assessments.	0.651
		Artificial Intelligence might replace people for assessments (*)	0.592
		I am able to get feedback on my teaching through AI.	0.581
3	Ease of Use	AI platforms available for assessments in my institution have limited use (*)	0.814
		It is possible to customize AI as per my requirements	0.804
		I can get technical support for using AI	0.798
		I can customize all reports required for assessments through AI	0.779
		AI applications in assessments saves a lot of my time	0.758
		AI has made the mundane task of assessments easier	0.722
		I am able to complete more assessments in shorter span of time.	0.69
		Artificially intelligent systems can keep students well informed	0.649
		I am impressed by what Artificial Intelligence can do in assessments	0.601
		I think artificially intelligent systems make many errors (*)	0.597
		I am interested in using artificially intelligent systems in my routine assessment work.	0.576
Eigen Value and Variance explained			
Factor	Eigen Value	Variance Explained (%)	Total Variance Explained (%)
1	3.68	33.4	33.4
2	2.59	29.1	62.5
3	1.44	15.3	77.8

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